

**1980**

**KENTUCKY**

**305(b)**

**REPORT TO CONGRESS**

**ON**

**WATER QUALITY**

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VOLUME I.

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## EXECUTIVE SUMMARY

## EXECUTIVE SUMMARY

The following pages contain the Kentucky 1980 Water Quality Report to Congress, as required by Section 305(b) of the Federal Water Pollution Control Act Amendments of 1972, Public Law 92-500, 86 Stat. 816, as amended by the Clean Water Act of 1977, Public Law 95-217, 91 Stat. 1566, 33 USC Sec. 1315 (b). This report reflects the current interpretations of the conditions of the Commonwealth of Kentucky and the resources needed to achieve the goals of the Clean Water Act of 1977. Some of the main topics of discussion include: ambient and biological monitoring, lakes inventory, wetlands, groundwater, shellfish, drinking water supplies, point and non-point source pollution, problems and recommendations, and a chapter summary of the history of the Division of Water Quality.

This report is compiled in two volumes. Volume I is the main body containing all summaries, descriptions, and conclusions for each subject. Volume II contains the tabulated data which supports the conclusions and statements made in Volume I. The monitoring data, presented in Volume II, represents a qualitative translation of the raw data that was collected in the field. It is hoped this type of format will be most meaningful to the non-technical reader. This technical data used to develop this report is available upon request.

Of Kentucky's thirteen river basins, one has very good water quality, five have good water quality, and seven have fair water quality. (Refer to Chapter 2, Under Existing Conditions, for an explanation of these subjective water quality assessments.)

Estimated water quality trends within the basins are basically all stable with the exceptions of two reporting degradation and one improvement. The seven biological monitoring stations indicated the respective streams capable of supporting some form of aquatic life. Water quality at these seven stations varied from a clean water stream to a stream impacted heavily by surface mining. During 1979, fifteen fish kills were reported to the Division of Water Quality. Of this number, three were assessed as total kills, five as heavy, and three as moderate. The majority of the Commonwealth's seventeen major lakes have good water quality. Exceptions are mostly related to aesthetic degradation due to turbidity. The worst problems occur in the Huntington Corps of Engineers District where mining activities in two watersheds are the major contributors to excessive turbidity in the lakes.

The projected costs to meet point source treatment levels (advanced secondary and advanced wastewater) and to arrest non-point source pollution are .3 and 2.1 billion dollars respectively. Non-point source pollution assessments are continuing while the initial voluntary NPS improvement program is being implemented. The control of non-point source pollution may play a decisive role in determining the quality of Kentucky's streams. The success or failure of point and non-point source pollution abatement programs will be affected by the amount of federal funding, and the effective management of it in Kentucky.

The main stem of the Ohio River has not been addressed in this report. The Ohio River Valley Water Sanitation Commission



(ORSANCO) has compiled a report to be used as a supplement to the 305(b) Reports submitted by the member states of the Commission. Copies of ORSANCO's 1980 305(b) Report may be obtained from the:

Ohio River Valley Water  
Sanitation Commission  
414 Walnut Street  
Cincinnati, Ohio 45202  
(513) 421-1151

Table I on river basin populations and Table 2 on the average discharge for each major river in cubic feet per second (cfs) provide the reader with an introduction of the priorities of this report: people and water. Protecting water for use by the people of Kentucky and insuring its quality for aquatic life, recreation, agriculture, and public consumption is the function of the Division of Water Quality. The following pages expand and verify this statement.

TABLE 1  
RIVER BASIN POPULATIONS

Big Sandy	220,717
Upper Cumberland	342,213
Green	497,471
Kentucky	706,366
Licking	211,986
Little Sandy	59,936
Mississippi	51,550
Ohio	868,538
Tennessee	62,668
Tradewater	64,038
Tygarts	27,028
Salt	446,469
Lower Cumberland	90,112
	<u>3,649,092</u>

Note: Calculations based on the University of Louisville study, completed in 1979.

TABLE 2  
AVERAGE DAILY FLOWS \*

Big Sandy River	4,450 cfs
Upper Cumberland River	9,100 cfs
Green River	11,000 cfs
Kentucky River	7,200 cfs
Licking River	4,150 cfs
Little Sandy River	***
Mississippi River	**
Ohio River at:	
Huntington	70,000 cfs
Cincinnati	98,000 cfs
Louisville	106,000 cfs
Evansville	135,000 cfs
Metropolis	265,000 cfs
Tennessee River	64,000 cfs
Tradewater River	***
Tygarts Creek	***
Salt River	3,300 cfs
Lower Cumberland River	27,000 cfs

\* Flows measured at or near the mouths of the streams.

\*\* Kentucky contribution to the Mississippi River not available.

\*\*\* Included within the Ohio River flow.

## CHAPTER I

### CURRENT CONDITIONS AND RECENT TRENDS IN STREAM WATER QUALITY

## AMBIENT MONITORING PROGRAMS

The Division of Water Quality's primary ambient monitoring network has been in full operation since June of 1979. The network consists of 30 stations distributed across the state as shown in Figure 1. Monthly samples are collected by the respective field office (see Figure 2) and analyzed according to the parameter list shown in Table I.

Three other agencies maintain monitoring networks in Kentucky in cooperation with the Division of Water Quality (DWQ): The Ohio River Valley Water Sanitation Commission (ORSANCO) maintains eleven main stem Ohio River stations and five major tributary stations. (For more information, refer to ORSANCO's 1980 305(b) Report.) The United States Geological Survey maintains a National Stream Quality Accounting Network (NASQAN) composed of four main stem Ohio River stations and eight major tributary stations. The Army Corps of Engineers maintains surveillance at its fifteen major lakes in the Commonwealth. The information on Lakes Inventory contributed by the Corps is included in Chapter 2. The raw data compiled from these four programs are presented in Volume II of this report.

The DWQ is also participating in the U. S. Environmental Protection Agency's Basic Water Monitoring Program (BWMP) (see Figure I). This is a nationwide ambient monitoring network implemented in FY 78. Kentucky's commitment to the core network consists of 7 of the Division's 30 Primary Network stations and 9 from ORSANCO's 16 Kentucky stations.

# MONITORING STATIONS

KENTUCKY Base Map Series A-7  
Compiled and distributed by  
Kentucky Department of Commerce  
Frankfort, Kentucky  
1964

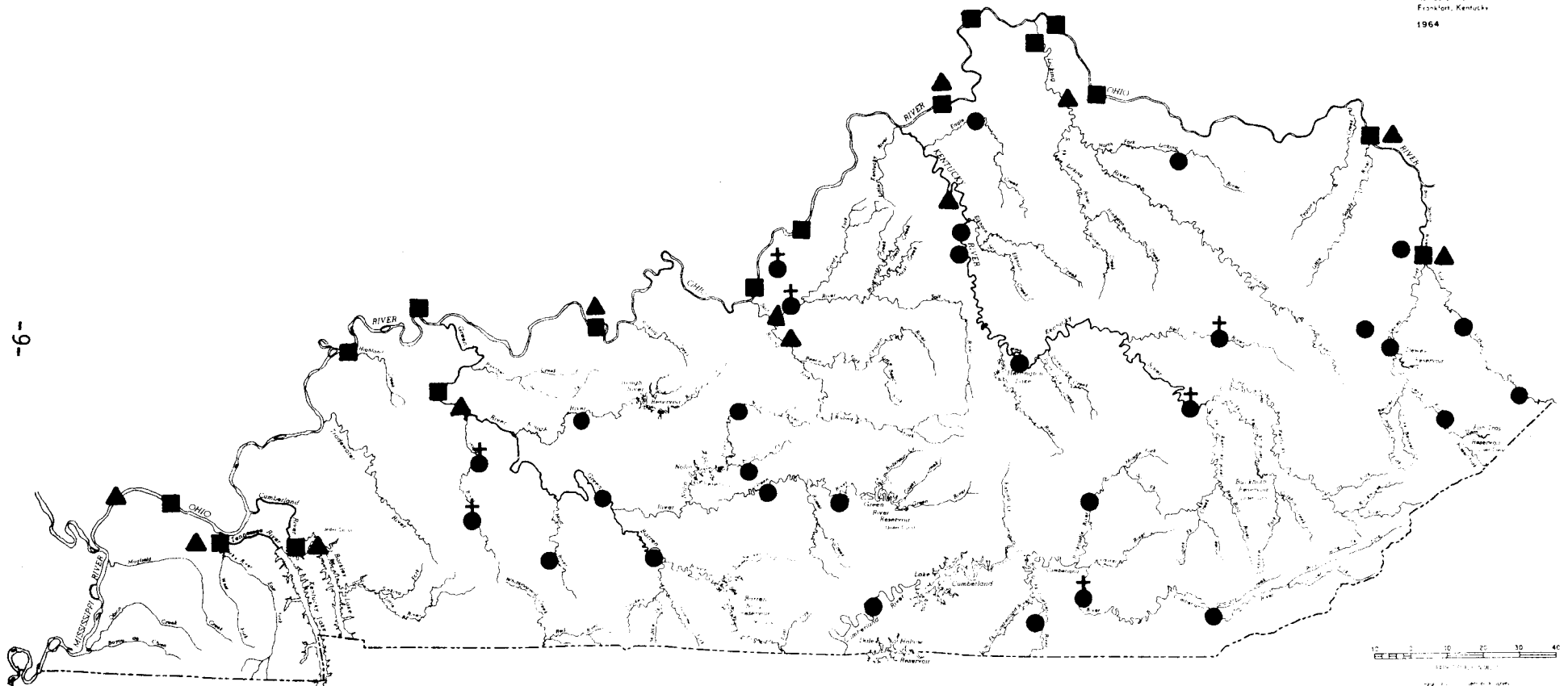


FIGURE 1

- DWQ Primary Network
- ORSANCO Network
- ▲ USGS NASQAN Stations
- ⊕ DWQ Primary Network And BWMP

# FIELD OFFICE AREAS

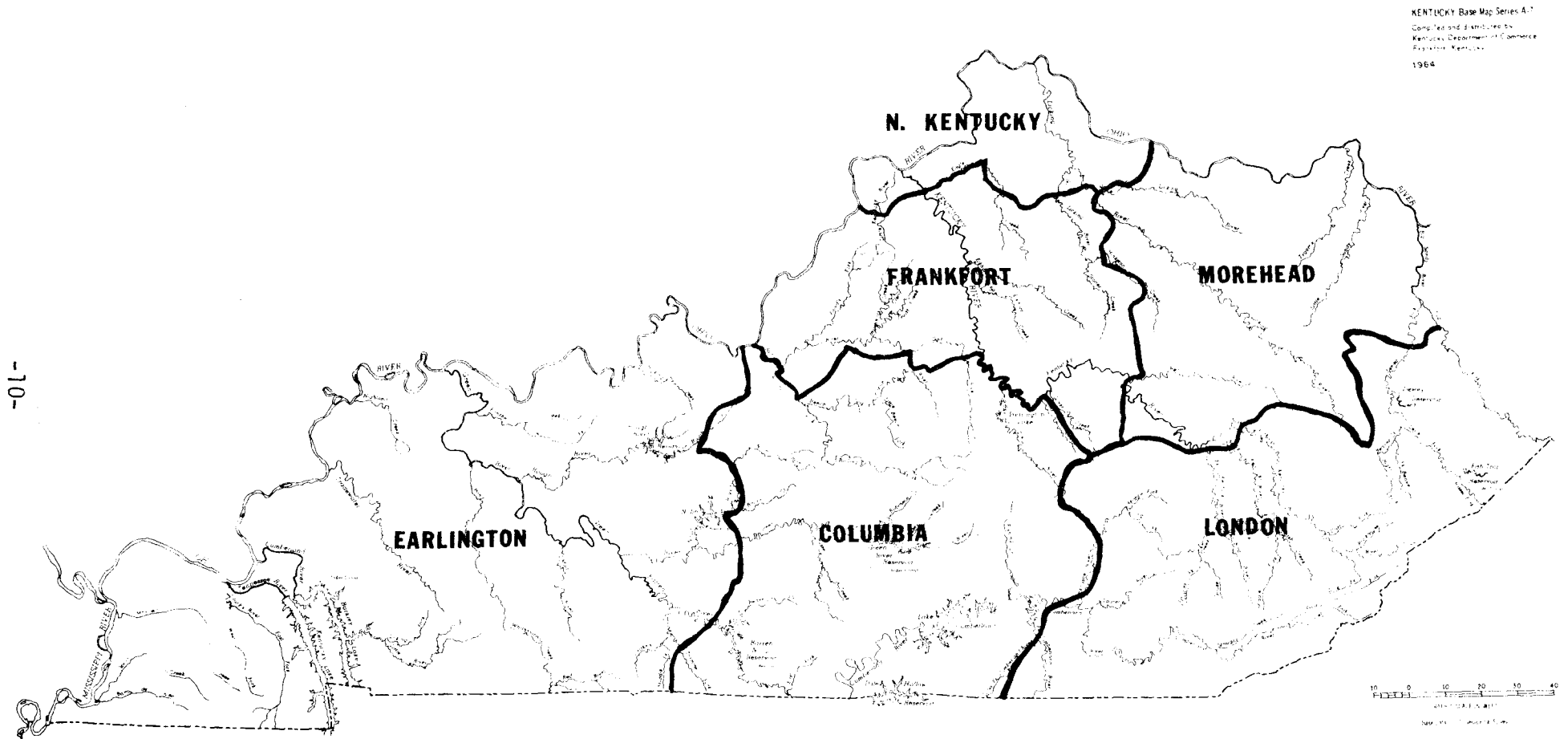


FIGURE 2

TABLE 3

## MONITORING PARAMETER LIST

## Lab Parameters

Acidity	Lead, Total
Alkalinity	Turbidity
Hardness Total	Total Phosphorus
Sulfates	NO <sub>2</sub> + NO <sub>3</sub> - N
Specific Conductance	Dissolved Cadmium
Dissolved Solids	Dissolved Chromium
Suspended Solids	Dissolved Calcium
Silica, Dissolved	Dissolved Potassium
Chloride	Dissolved Manganese
Fluoride, Electrode	Dissolved Arsenic
Arsenic, Total	Dissolved Barium
Copper	Dissolved Copper
Chromium, Total	Dissolved Iron
Chromium, Hex	Dissolved Lead
Mercury, Total	Dissolved Mercury
pH	Dissolved Nickel
BOD, 5 day/20 deg. C.	Dissolved Selenium
COD	Dissolved Silver
TOC	Dissolved Zinc
TKN	Dissolved Sodium
NH <sub>3</sub> -N	Dissolved Magnesium
MBAS	

## Field Parameters

Air Temperature	Transparency (Secchi disk)
Water Temperature	Depth
Field pH	Flow
Field DO	Stage, Stream
Field Conductivity	%RB
Field Turbidity	



## EXISTING CONDITIONS

A general picture of the existing stream conditions in Kentucky can be formed using the monitoring data described in the Ambient Monitoring Programs section and two other sources. These consist of the intensive survey studies and the field office surveys. The intensive survey studies were implemented in FY 78 and concentrated primarily on wasteload allocation investigations and trophic assessments of lakes. Eleven studies have been conducted to date in six of the thirteen river basins. Parameter summaries are grouped under ten general categories: thermal, oxygen depletion, nutrients, bacteria, suspended solids, dissolved solids, pH, oil and grease, heavy metals, and, pesticides and toxics. The raw data are presented in Volume II of this report.

The DWQ conducted a survey among the six field offices (See Figure 2) during the months of December 1979, and January 1980. Personnel within each field office responded to the ten categories previously mentioned above. These categories were assessed as follows: degree of problem, point sources, non-point sources, and trends. Survey forms were completed for 90% of Kentucky's four hundred eighty-two 303(e) segments. In some river basins, the field office surveys were the only source of data available to the Division to assess the existing stream conditions. These data are presented in Volume II of this report.

In the following paragraphs, a brief summary of the water quality in each of the 13 river basins is presented. All

conclusions are based upon the monitoring data from the DWQ's 30 primary stations, USGS's eight tributary NASQAN stations, ORSANCO's five tributary stations, eleven intensive stream surveys, and the field office survey. General quality assessments of very good, good, and fair correspond to the number of reported Kentucky Water Quality Standards violations, as indicated by the sources of monitoring data previously listed. Any trend reporting was based on the subjective assessments of field and central office personnel.

#### BIG SANDY RIVER BASIN

The quality of the Big Sandy River Basin is generally fair. Few to no violations of the Kentucky Water Quality Standards (KWQS) occurred. A minor problem was reported with suspended solids. This was due primarily to point source discharges from municipalities and combined sewer overflows. There are insufficient data to determine any long term trends.

#### UPPER CUMBERLAND RIVER BASIN

The quality of the Upper Cumberland River Basin is generally good. Few violations of the KWQS occurred. A minor problem was reported with suspended solids levels due primarily to non-point source runoff from mining. The Laurel Reservoir intensive survey reported problems with tributary oxygen depletion and nutrient levels (localized nuisance algal blooms) due to point source municipal discharges, and non-point source agricultural loadings. The Middlesboro Yellow Creek intensive survey reported major problems of physical and chemical stress due to the Middlesboro sewage treatment plant and to tannery discharges. Data are insufficient to determine any long term trends.

#### GREEN RIVER BASIN

The quality of the Green River Basin is generally fair. The Barren Reservoir intensive survey indicated moderate problems with nutrient levels due to point source and non-point source contributions from Glasgow and agricultural runoff. Moderate oxygen depletion problems occurred in other segments due to point source municipal discharges and non-point source runoff from urban and agriculture areas. Moderate problems with pH occurred due to mining activities in the watershed. A survey conducted by the Earlington Field Office in 1978 revealed that numerous pH violations occurred in smaller streams due to acid mine drainage. High levels of mercury were reported in the Green River at Sebree in April, 1978 by ORSANCO. The resultant Division of Water Quality intensive survey did not verify the existence or the potential source of elevated mercury concentrations. The water quality trend is estimated as stable.

#### KENTUCKY RIVER BASIN

The quality of the Kentucky River Basin is generally fair. Minor problems with respect to oxygen depletion, suspended solids, bacteria, and nutrient levels were reported. These were due to point source discharges from municipalities and combined sewers, and non-point source runoff from agriculture and mining areas. The water quality trend is estimated as stable.

#### LICKING RIVER BASIN

The quality of the Licking River Basin is generally fair. Moderate violations of the KWQS with bacteria levels were found. This was due primarily to point source discharges from municipalities and non-point source runoff from septic tanks and agriculture. Minor problems were reported with respect to oxygen depletion, nutrient levels, and suspended solids.

These were due to the same sources listed for bacteria. The water quality trend is estimated as stable.

#### LITTLE SANDY RIVER BASIN

The quality of the Little Sandy River Basin is generally fair. Available data comes only from the field office survey. Major violations of the KWQS occurred with bacteria levels due to point source discharges from municipalities and non-point source runoff from agriculture and septic tanks. The water quality trend is estimated as stable.

#### MISSISSIPPI RIVER BASIN

The quality of the Mississippi River Basin is generally good. Available data comes only from the field office survey. Minor violations of the KWQS occurred with bacteria levels due to point source discharges from municipalities and non-point source runoff from agriculture. Moderate problems with sedimentation concentrations occurred due to non-point source runoff from agriculture. The water quality trend is estimated as stable.

#### OHIO RIVER BASIN

The quality of the Ohio River Basin is generally good. Water quality problems were reported from the Gunpowder Creek intensive survey with oxygen depletion, bacteria, and nutrient levels. These were due to point source discharges from municipalities and non-point source runoff from agriculture. Minor violations in bacteria levels occurred in other watersheds due primarily to point source discharges from municipalities and non-point source runoff from agriculture and urban areas. An acid mine drainage survey conducted in 1978 by the Earlinton Field Office reported pH violations in the lower Ohio drainage area. The water quality trend is estimated as stable. Detailed information is available from ORSANCO's 305(b) Report.

#### TENNESSEE RIVER BASIN

The quality of the Tennessee River is generally very good. No violations of the KWQS were reported. The water quality trend is estimated as stable.

#### TRADEWATER RIVER BASIN

The quality of the Tradewater River Basin is generally fair. Available data comes from the field office survey and from an acid mine drainage survey conducted in 1978 by the Earlington Field Office. Moderate violations of the KWQS occurred in pH due to non-point source runoff from mining. There was a slight trend towards degradation.

#### TYGARTS CREEK BASIN

The quality of the Tygarts Creek Basin is generally fair. Available data comes only from the field office survey. Moderate problems occurred with oxygen depletion, nutrients, bacteria, suspended solids, and pH. These were due primarily to point source discharges from municipalities and combined sewers and non-point source runoff from agriculture and septic tanks. There is a slight trend towards degradation.

#### SALT RIVER BASIN

The quality of the Salt River Basin is generally good. The McNeely Lake intensive survey reported significant problems with oxygen depletion and nutrient levels due primarily to point source discharges from residential treatment facilities. Minor problems with oxygen depletion and nutrients were reported by the field offices in other watersheds in the basin due primarily to point source discharges from municipalities. There is a slight trend towards water quality improvement.

#### LOWER CUMBERLAND RIVER BASIN

The quality of the Lower Cumberland River Basin is generally good. Minor water quality problems occurred with oxygen depletion, nutrient levels, bacteria, suspended solids, and dissolved solids. These were due primarily to point source discharges from municipalities and non-point source runoff from agriculture. The water quality trend is estimated as stable.

## EVALUATING WATER QUALITY TRENDS

The Division of Water Quality is unable to make any quantitative trend analysis, at this time, for the following reasons:

- (1) The DWQ Primary Ambient Monitoring Network Stations have only been in full operation since June of 1979. This is insufficient time for trend analysis.
- (2) Although data from the ORSANCO and the USGS NASQAN stations have been available for several years, these tributary stations are located primarily at the mouths of the major rivers. Sufficient data are not available from the headwaters to the mouths.

Although the Division of Water Quality recognizes the need for quantitative trend analysis, the Division is hesitant to make conclusions on insufficient data. Sufficient information can be collected to rank the change of point and non-point contributions to streams and to supplement our understanding of stream based information. Without an effective understanding of the total water system, trends of water quality change cannot be developed. Information available for the 1982 305(b) Report will allow complete understanding of the trends in water quality changes in Kentucky.

# RIVER BASINS

- 01 Big Sandy River
- 02 Upper Cumberland River
- 03 Green River
- 04 Kentucky River
- 05 Licking River
- 06 Little Sandy River
- 07 Mississippi River
- 08 Ohio River
- 09 Tennessee River
- 10 Tradewater River
- 11 Tygarts Creek
- 12 Salt River
- 20 Lower Cumberland River

KENTUCKY Base Map Series A-7  
 Compiled and distributed by  
 Kentucky Department of Commerce  
 Frankfort, Kentucky  
 1964

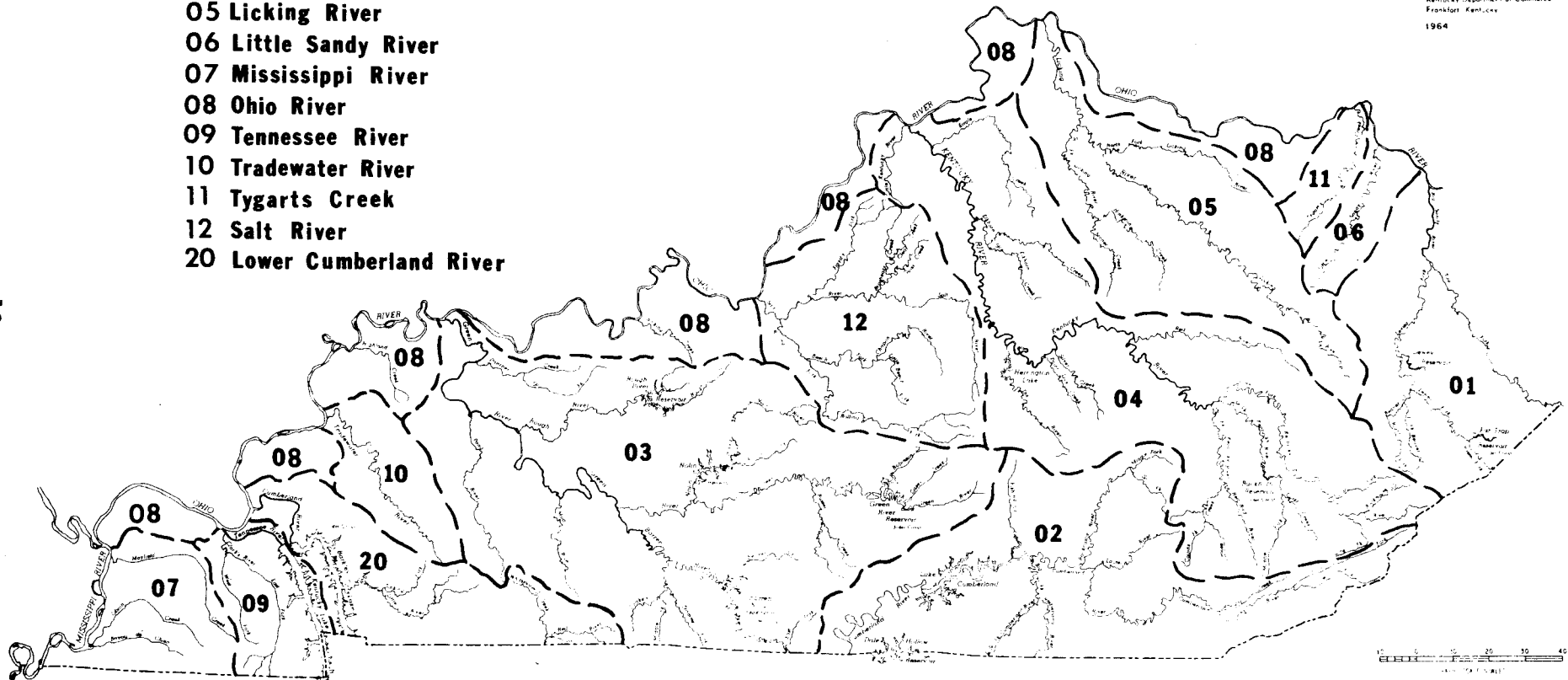


FIGURE 3



# USGS HYDROLOGIC SEGMENTS

KENTUCKY Base Map Series A-7  
Compiled and distributed by  
Kentucky Department of Commerce  
Frankfort, Kentucky  
1964

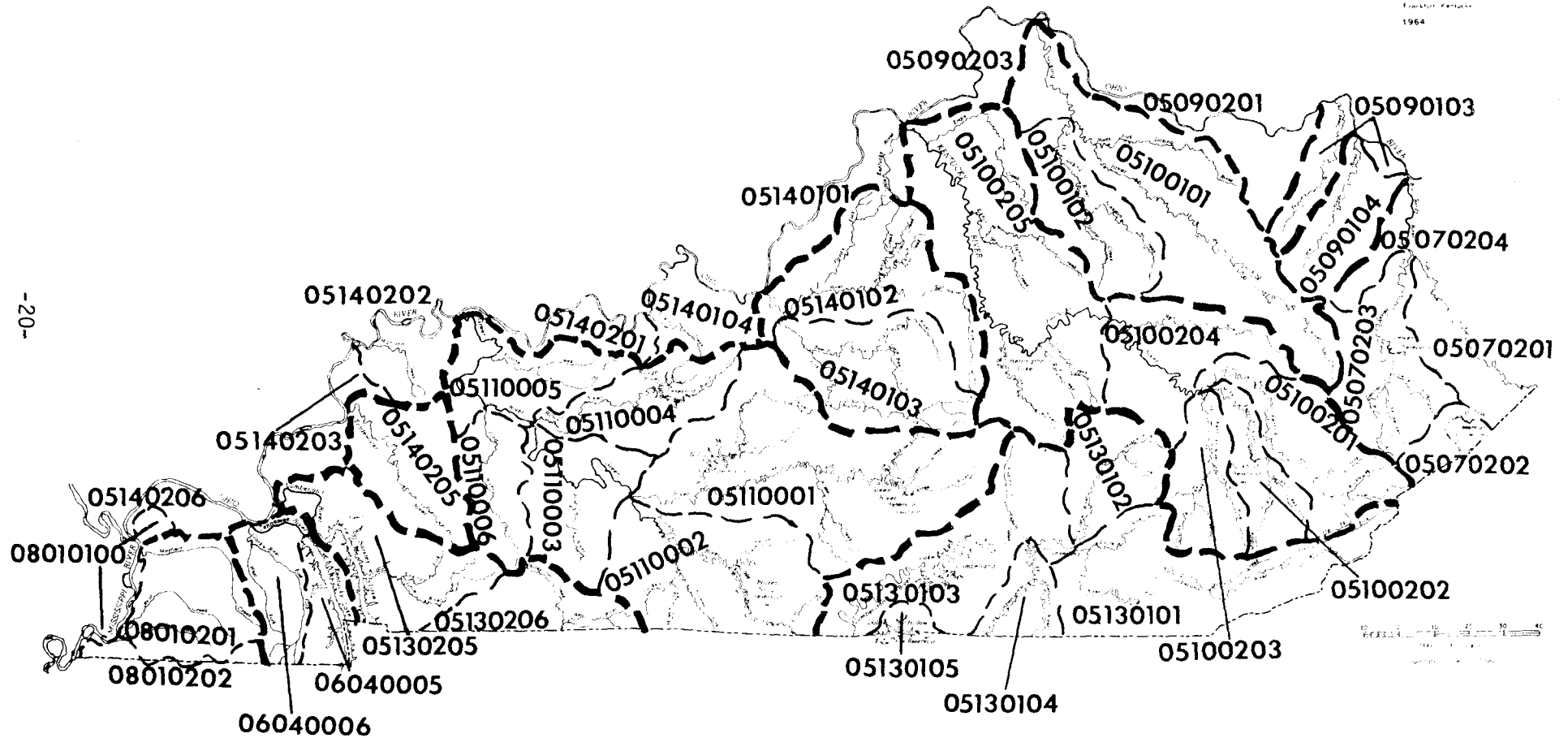


FIGURE 4

Segment Boundry - - - - -  
River Basin Boundry — — — — —

## BIOLOGICAL MONITORING

Section 106(e) of the Clean Water Act of 1972, as amended, Pub. Law 92-500, 33 USC Sec. 1256(e), requires each state to monitor the quality of its surface waters. In accordance with the Act, the Kentucky Division of Water Quality developed an ambient and biological monitoring program. The main objectives of this program are to develop a baseline of biological and physiochemical data, to meet the Environmental Protection Agency's Basic Water Monitoring Program (BWMP) requirements, to detect trends in water quality, and to determine the general efficiency of pollution abatement programs.

The intent of this portion of the 305(b) report is to characterize the aquatic biota and the water quality of the seven BWMP stations in Kentucky. The period of data collection at these stations is brief. Therefore, the characterization of these stream stations depends on the biologists interpretation of data collected and streamside observations.

Generally, the water quality of the seven stations monitored ranged from a clean water stream to a stream impacted heavily by surface mining. All monitored streams were capable of supporting some form of aquatic life to some extent, but the composition and productivity of the aquatic biota were dependent on the type and severity of impact.

## Glossary

- Hypolimnion - the uniformly cool and deep layer of a lake when it is thermally stratified in summer.
- Macroinvertebrates - By definition are those organisms that are retained on a U.S. Standard No. 30 sieve. This includes approximately 7 orders of insects and representatives from Decapoda and Mollusca.
- Hexagenia - A genus of burrowing mayflies.
- Facultative - organisms having a wide range of tolerance and frequently are associated with moderate levels of organic contamination.
- Tolerant - organisms frequently associated with gross organic contamination and are generally capable of thriving under anaerobic conditions.
- Intolerant - organisms that are not found associated with even moderate levels of organic contaminants and are generally intolerant of even moderate reductions in dissolved oxygen.
- Nacre - Nacreous layer, mother of pearl, innermost lustrous layer of the shell of mollusks, especially in gastropods and pelecypods; secreted by mantle epithelium.

## Glossary

- RMI - River Mile Index (RMI). A linear measurement of stream distance. A stream's confluence is considered the zero milepoint, and enumeration proceeds upstream to headwaters.
- Stream Order - A stream classification. It is based on branching patterns as determined from topographic maps. Extreme headwaters are categorized as order I, the union of two such streams produces an order II stream, the joining of two of the latter gives rise to an order III stream, and so on.

Green River Basin  
Station #03004901  
Pond River - Apex

Location

Coordinates: 37° 7' 20"N, 87° 19' 10"W  
County: Muhlenberg/Christian  
Kentucky RMI: 197.2, 55.1, 62.8  
DOWQ Map No: 5 - 22  
Topo Quad Name: Haley's Mill, Ky.  
Physiographic Region: Western Coalfield

Station Information

Period of Record: 3/78 to date  
Type of Sampling: Chemical & Biological  
Stream Order: IV  
Stream Width: 15m  
Stream Depth: 0.5 - 2.0m  
Stream Morphology: pool (run)  
Substrate: silt & detritus

Impacts

This station has been channelized, has been cleared of trees, and is affected by surface mining and oil well operations. Agricultural practices also impact this station although probably to a lesser extent than surface and oil mining ones.

Water Quality Evaluation

Biological: This segment of Pond River supports a good assemblage of aquatic biota. Fish sampling yielded large-mouth bass, crappie, channel catfish and bowfin. While bowfin are characteristic of turbid waters with low dissolved oxygen and high temperature, the presence of game species of fish in a stream with poor habitat indicates better water quality than what might be expected. This is in agreement with the algal data which showed an above average number of species. Several unique diatom and blue-green algae were collected as well as several algal species characteristic of clean, well oxygenated waters. The macroinvertebrate species collected were generally facultative, but it should be noted that three mayfly larvae were collected here where none were collected at the downstream station (#03004901).

Chemical: Elevated levels were noted for manganese, barium, copper, lead, cadmium, chromium, and chloride. The elevated chloride values are indicative of oil drilling operations in the watershed although a corresponding increase in conductivity levels was not noted. Dissolved oxygen, pH, temperature, and alkalinity generally remained favorable for aquatic life.

Kentucky River Basin  
Station #04039900  
Kentucky River, Heidelberg Lock & Dam #14

Location

Coordinates: 37° 33' 8"N, 83° 46' 11"W  
County: Lee  
Kentucky RMI: 435.6, 249.0  
DOWQ Map No: 9 - 50  
Topo Quad Name: Heidelberg, Ky.  
Physiographic Region: Eastern Coalfield

Station Information

Period of Record: 5/77 to date  
Type of Sampling: Chemical & Biological  
Stream Order: VI  
Stream Width: 80 - 100m  
Stream Depth: 2 - 5m  
Stream Morphology: impounded pool  
Substrate: silt & debris; limestone rock ledges

Impacts

The chief impact to the river appears to be siltation from surface mining (especially on the North and Middle Fork watersheds) and agricultural practices. The town of Beattyville (pop. 1500) is 16 miles upstream.

Water Quality Evaluation

Biological: The Kentucky River supports a fair diversity of aquatic organisms. Fish collections included bluegill, channel catfish, suckers, and minnows. The river supports a sports fishery and a limited commercial fishery. Macroinvertebrate organisms were generally comprised of facultative taxa although several species collected are somewhat sensitive. Algal collections were less diverse than many of the biological stations. The assemblage of green algae seems to indicate moderate nutrient enrichment although chemical data shows low nutrient levels.

Chemical: Elevated levels were noted for copper, mercury, lead, and cadmium. Average values for total mercury were the highest seen of the seven biological stations. Values for dissolved oxygen, pH, alkalinity, and temperature were favorable for aquatic organisms.

Green River Basin  
Station #03004900  
Pond River below Isaac Creek

Location

Coordinates: 37° 21' 16"N, 87° 19' 3"W  
County: Muhlenberg/Hopkins  
Kentucky RMI: 197.2, 55.1, 12.4  
DOWQ Map No: 8 - 22  
Topo Quad Name: Millport, Ky & Sacramento, Ky.  
Physiographic Region: Western Coalfield

Station Information

Period of Record: 3/78 to date  
Type of Sampling: Chemical and Biological  
Stream Order: V  
Stream Width: 2m (low flow), 2 miles (high flow)  
Stream Depth: 0.5 - 3m (low flow), 10m+ (high flow)  
Stream Morphology: riffle, pool  
Substrate: sandstone bedrock, silt

Impacts

Pond River is impacted by acid mine drainage. At this station, the river flows through a wide floodplain which is inundated from late fall through spring forming a Type I periodically flooded wetland. During the summer, the floodplain is intensively cultivated.

Water Quality Evaluations

Biological: Pond River supports a poor diversity of aquatic organisms despite suitable habitat. This station produced the fewest number of algal species of any of the biological stations. Over half the species collected were indicative of acidic pH. Few green or blue-green algae were collected despite an adequate nutrient supply. Collections of macroinvertebrate organisms were limited to tolerant and facultative species. This is the only station where no mayfly larvae were collected. It is possible that toxic quantities of heavy metals have accumulated in the sediments excluding burrowing forms such as Hexagenia (collected upstream at #03004901). Fish collections were not attempted due to high water conditions.

Chemical: Values for acidity, conductivity, turbidity, sulfates, dissolved solids, manganese, iron, nickel,



zinc, and magnesium were the highest seen of the seven biological stations. Elevated levels for lead, TKN, and NH<sub>3</sub>-N were noted. Low values were recorded for alkalinity, pH, and dissolved oxygen. These values indicate severely degraded water quality. Mercury values at this station were twice what was recorded at the upstream station (#03004901)

Kentucky River Basin  
Station #04043900  
Red River - Hazel Green

Location

Coordinates: 37° 48' 43"N, 83° 27' 35"W  
County: Wolfe  
Kentucky RMI: 435.6, 190.75, 72.6  
DOWQ Map No: 11 - 53  
Topo Quad Name: Hazel Green, Ky.  
Physiographic Region: Eastern Coalfield

Station Information

Period of Record: 12/1/76 to date  
Type of Sampling: Chemical & Biological  
Stream Order: IV  
Stream Width: 3 - 5m  
Stream Depth: 0.5 - 1.5m  
Stream Morphology: riffle, pool  
Substrate: sandstone bedrock, shingles, boulders, rubble,  
gravel, and sand

Impacts

Current impacts are limited to agricultural and domestic septic tank runoff. Future impact from surface mining is possible as a permit has been issued for mining on the Lacy Creek and Gilmore Creek watersheds. An oil spill was reported on this segment on July 6, 1979.

Water Quality Evaluation

Biological: Red River supports a good assemblage of aquatic organisms. Fish collections included many top line predators and game species including three species of bass. Collections are in agreement with and exceed historical fish data. This diversity of fish, particularly in a fourth order stream, is indicative of good water quality. This is in agreement with data for macroinvertebrates. The presence of clams, stoneflies, caddisflies, and sensitive mayflies, each occupying a different niche, indicates good water quality and abundant, diverse microhabitats. The diversity of macroinvertebrates explains the good diversity of fish - much food is available. Likewise, a diverse population of algae was noted consisting of many pollution sensitive species of desmid and diatom algae. The

presence of the red alga Lemanea indicated good water quality. Blue-green and green algal species indicate low level nutrient enrichment.

Chemical: Elevated values were noted for copper, mercury, lead, and cadmium. Many parameters showed the lowest values for any of the seven biological stations. Values for dissolved oxygen, pH, temperature, and alkalinity were favorable for aquatic life.

Salt River Basin  
Station #12002900  
Salt River - Shepherdsville

Location

Coordinates: 37° 59' 05"N, 85° 43' 01"W  
County: Bullitt  
Kentucky RMI: 351.5, 22.87  
DOWQ Map No: 12 - 35  
Topo Quad Name: Shepherdsville, Ky.  
Physiographic Region: Knobs

Station Information:

Period of Record: 12/77 to date  
Type of Sampling: Chemical & Biological  
Stream Order: V  
Stream Width: 50 - 60m  
Stream Depth: 1 - 5m  
Stream Morphology: pool  
Substrate: limestone bedrock, silt, debris

Impacts

This segment of the Salt River is affected by agricultural runoff and urban effluence from the upstream municipal wastewater treatment plant. An impoundment of the river at Taylorsville will be completed in the near future.

Water Quality Evaluation

Biological: Salt River has a fair assemblage of aquatic organisms. Fish collections in 1979 produced sauger and crappie while collections in 1978 yielded only "rough" fish such as buffalo and carpsucker. Many of the macroinvertebrate organisms collected are considered facultative to tolerant; however, the burrowing mayfly, Potamanthus, was collected only at this station. Algal collections indicated nutrient enrichment and elevated conductivity levels. While algal species diversity was above average, most forms collected were either tolerant or facultative to pollution.

Chemical: Values for copper, mercury, lead, cadmium, and iron were elevated. Nutrient values were elevated except for ammonia nitrogen which were low. Above average values were noted for conductivity, dissolved solids, suspended solids, chlorides, BOD and COD. Dissolved oxygen, pH, temperature, and alkalinity generally remained favorable for aquatic life.

Salt River Basin  
Station #12032900  
Pond Creek - Louisville

Location

Coordinates: 38° 07' 12"N, 85° 47' 48"W  
County: Jefferson  
Kentucky RMI: 351.5, 0.4, 15.4 (7.8B)  
DOWQ Map No: 13 - 34  
Topo Quad Name: Valley Station, Ky.  
Physiographic Region: Ohio River Alluvium

Station Information

Period of Record: 12/77 to date  
Type of Sampling: Chemical & Biological  
Stream Order: IV  
Stream Width: 3 - 6m  
Stream Depth: 0.5 - 3m  
Stream Morphology: riffle, run, pool  
Substrate: limestone boulders, rubble, sand, silt

Impacts

Pond Creek drains a heavily industrialized section of Jefferson County including three landfills and over 160 point source discharges. Wilson Creek, a tributary to Pond Creek, is the stream impacted by the infamous Valley of the Drums. The watershed is 88% industrial and urban.

Water Quality Evaluation

Biological: Pond Creek supports a poor assemblage of aquatic organisms. Fish collections were limited to sunfish and minnows while collections of macroinvertebrate organisms produced only tolerant forms. Algal collections indicated severe nutrient enrichment and high conductivity levels. The potential for nuisance algal growth is high, particularly during low flow periods.

Limiting factors to aquatic life include poor habitat and degraded water quality. Much of Pond Creek is cleared and channelized or has been in the past. Stream bottom sediments consist of clay, sand, and shale particles leaving little area for macroinvertebrate colonization. Toxic concentrations of heavy metals may be present in the sediments (water column values are elevated). Pond Creek probably once had good potential as a fish nursery for the Salt and Ohio Rivers but is now limited by water quality degradation and the physical structure of the stream.

Chemical: Values for suspended solids, BOD, COD, chlorides, fluorides, and nutrients were the highest observed of all of the biological stations. Values for chromium, lead, cadmium, zinc, and mercury are elevated. Above average values for conductivity, turbidity, and sulfates were noted.

Cumberland River Basin  
Station #02018900  
Cumberland River above Cumberland Falls

Location

Coordinates: 36° 50' 13"N, 84° 20' 38"W  
County: Whitley/McCreary  
Kentucky RMI: 58.9, 562.3  
DOWQ Map No: 3 - 46  
Topo Quad Name: Cumberland Falls, Ky.  
Physiographic Region: Eastern Coalfields

Station Information

Period of Record: 10/77 to present  
Type of Sampling: Chemical & Biological  
Stream Order: VI  
Stream Width: 100m  
Stream Depth: 0.5 - 2m  
Stream Morphology: riffle - run  
Substrate: sandstone bedrock, boulders

Impacts

Cumberland River is impacted by siltation from surface mining and agricultural practices. The area is sparsely populated. The town of Williamsburg (pop. 4000) is located 18 miles upstream. A potential problem exists for the Cumberland Falls State Park water treatment plant in the form of total and dissolved lead levels in excess of the Domestic Water Supply Standards.

Water Quality Evaluation

Biological: Cumberland River supports a good diversity of aquatic organisms. While fish collections were not made in 1979, collections in 1978 produced channel catfish and spotted (Kentucky) bass. Historical data cited smallmouth bass, rock bass, sunfish, suckers, and various minnows. The diversity of game species of fish, particularly in a stream with rather limited habitat, is indicative of good water quality. Macroinvertebrate collections yielded many caddisfly and mayfly larvae despite limited microhabitat. The caddisfly genus Neureclipsis is listed as silt intolerant although physiochemical data shows elevated suspended and dissolved solids values at this station. Several species collected are indicative of well oxygenated waters. Algal collections yielded many unique diatom

and desmid algae indicative of clean waters. The presence of the red alga Lemanea is also indicative of this condition. The abundance of green algae collected is indicative of moderate nutrient enrichment which is confirmed by chemical data.

Chemical: Elevated values were noted for suspended solids, chromium, mercury, lead, cadmium, and total phosphorous. Average values for total phosphorous were twice what the EPA recommends as a maximum value for streams entering a lake system. Suspended solids values over 400 mg/l have a deleterious effect on benthic macroinvertebrates. Maximum values at this station were in excess of 500 mg/l. The total and dissolved lead problems for the drinking water supply at the state park has been mentioned previously. Dissolved oxygen, pH, alkalinity, and temperature values are favorable for aquatic organisms.



## Fish Kills 1979

Pollution caused fish kills are investigated by the Kentucky Department of Fish and Wildlife and reported to the Division of Water Quality. During 1979, fifteen reports of fish kills were received by the Division. Of this number, three were assessed as total kills, five as heavy, three as moderate and four as light kills. Very few of the reports contained actual counts of dead fish, generally in the light category of 50-100 fish.

The causes of fish kills were varied, however, petroleum spills were the most frequent. Five kills (one-third of the total) were attributed to petroleum, either from broken pipelines or accidental spills. Of these five, one was total, three were heavy kills and one was moderate. Manure or feedlot runoff were blamed for four fish kills in 1979, only one of which was heavy. Two moderate fish kills were attributed to release of black water from coal mining operations. A light kill on Drennon Creek in Henry County was caused by release of hypolimnetic water from a water treatment plant pond.

A total fish kill in Wymers Branch (Jessamine Co) occurred when a tank truck carrying chlordane and heptachlor overturned, spilling its contents.

The causes of the other two kills could not be determined due to the time elapsed between the occurrence and the investigation.

TABLE 4  
REPORTED FISH KILLS IN 1979

Date	Location	Estimated Damage	Suspected Cause
March 14	Line Fork (Letcher Perry Co)	Moderate to Heavy	Petroleum
March 16	Leatherwood Creek (Perry Co)	Moderate	Mining
April 13	Johns Creek (Pike Co)	Moderate to Heavy	Mining
April 24	Farm Pond (Woodford Co)	Light	Unknown
June 26	Sinking Creek (Laurel Co)	Total	Unknown
July 15	Hinkston Creek (Bourbon Co)	Light	Manure
July 25	U. T. Cabin Creek (Lewis Co)	Heavy	Manure
August 3	Rockhouse Creek (Letcher Co)	Heavy	Petroleum
August 3	Little Leatherwood Creek (Perry Co)	Total	Petroleum
August 10	Poor Fork (Harlan Co)	Moderate	Petroleum
August 10	Drennon Creek (Henry Co)	Light	Water System
August 10	N. Fork Little River (Christian Co)	Light	Manure
August 11	Frogonery Branch (Johnson Co)	Moderate	Manure
August 27	Wymers Branch (Jessamine Co)	Total	Pesticides
Oct. 24	Wilson Creek (Bullitt/Nelson Co)	Heavy	Petroleum

Petroleum	5
Manure/ Feedlot	4
Mining	2
Water Treatment	1
Pesticides	1
Unknown	2

## SHELLFISH

The freshwater mussel harvest in Kentucky for 1977 and 1978 was confined to the Ohio, Tennessee, and Green Rivers. Data provided by the Department of Fish and Wildlife Resources indicate a harvest of eighty-four tons of shells for the two years.

The shells are consumed by foreign markets (primarily Japan) and used in the manufacture of cultured pearls. It is interesting to note that only mussels in the Mississippi River drainage are used in manufacture of cultured pearls. This is due primarily to the nacre characteristics inherent to the species occurring within the drainage. These characteristics allow tiny spheres to be formed from the nacre and then implanted within the host oyster.

In recent years there has been a marked decline in the mussel fauna of Kentucky. This is due in part to the loss of suitable habitat, which can be directly related to stream impoundments. Siltation, degraded water quality, and over-harvesting have also depleted the indigenous fauna of Kentucky.

The Kentucky Nature Preserves Commission has placed a total of twenty-seven species of indigenous mussels on the endangered list. Of these, nine species are on the

Federally Endangered List with an additional seven species that are extirpated from the state and considered to be extinct. The Federally Endangered List of mussels that occur in Kentucky are listed on the following page.

TABLE 5

SHELLFISH

Federally Endangered  
Mussels List for Kentucky

1. Dromus dromas - Dromdary Pearly Mussel  
Restricted to the Tennessee and Cumberland systems.
2. Epioblasma florentina - Yellow - blossom  
Pearly Mussels  
Cumberland River system - probably now extinct.
3. Epioblasma torulosa torulosa - Tuberculated - blossom  
Pearly Mussel  
Distributed in the Tennessee and Ohio River drainages.
4. Epioblasma walkeri - Tan Riffle Shell  
Tennessee and Cumberland River drainage.
5. Lampsilis orbiculata orbiculata - Pink Mucket Pearly Mussel  
Tennessee and Cumberland river system Ohio River, not collected  
in Kentucky in approximately thirty (30) years.
6. Plethobasus cicatricosus - No common name.  
Originally found in Tennessee River and the Ohio River.
7. Plethobasus cooperianus - Orange-footed Pimpleback Pearly Mussel;  
Cumberland Pigtoe  
Originally found in Cumberland, Tennessee, Ohio, Green drainages.  
No specimen reported in Kentucky in over thirty (30) years.
8. Pleurobema plenum - Rough Pigtoe Pearly Mussel  
Originally this species was taken in Ohio, Cumberland,  
and Green River systems.
9. Villosa trabalis - Cumberland Bean Pearly Mussel  
Originally reported from Cumberland river system, Rockcastle  
River, Buck and Beaver Creeks.